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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/750,054	12/30/2003	Steven Keating	42P16676	9101

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BLAKELY SOKOLOFF TAYLOR & ZAFMAN
12400 WILSHIRE BOULEVARD
SEVENTH FLOOR
LOS ANGELES, CA 90025-1030

EXAMINER	
DANG, TRUNG Q	
ART UNIT	**PAPER NUMBER**
2823	

DATE MAILED: 09/19/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/750,054	KEATING ET AL.	
	Examiner	Art Unit	
	Trung Dang	2823	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *27 June 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,4,5,7-24 and 26-30* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *16-19 and 28-30* is/are allowed.

6)☒ Claim(s) *1,4,5,7-15,20-24,26 and 27* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1, 4, 5, 10-15, and 20-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gonzalez et al. of record in view of Yasuda et al. (US 6,060,403).

> With reference to Figs. 1-5, Gonzalez teaches a process comprising the steps of: etching a recess 18 into a substrate **10**, the recess having a bottom **26** (Fig.4); implanting an ionized species of silicon into the bottom of the recess to form an amorphous etch stop region **30**, the ionized species being electrically neutral within the substrate (col. 5, lines 1-21); and etching the substrate with an anisotropic wet etch (Fig. 5).

Gonzalez differs from the claims in that while Gonzalez implants silicon into the semiconductor substrate **10** to form amorphous etch stop region **30**, the claims call for the implantation of at least one ionized species selected from the group consisting of the noble elements, the alkaline metals of column I to make the same.

Yasuda teaches amorphous silicon layer can be formed by means of ion implantation of at least one ionized species include silicon, hydrogen, and an inert gas element (col. 11, lines 19-25).

The subject matter as a whole would have been obvious to one of ordinary skill in the art to modify Gonzalez's teaching by replacing silicon ion with hydrogen ion (element of column I) or inert gas ion (noble gas) as suggested by Yasuda because the

substitution of art recognized equivalents to make the same would have been within the knowledge of one skilled in the art.

Note that the wet etch process using TMAH or KOH solution that forms cavity **34** in Fig. 5 reads on the claimed anisotropic wet etch because the aforementioned wet etch using both isotropic and anisotropic etch (col. 5, lines 36-41). Furthermore, the implanted species of hydrogen or inert gas is inherently electrically neutral within the substrate because these species are of the same type as claimed.

For claim 4, since the implanted dose disclosed in the reference (see Gonzalez at col. 10, line 43) is within the range disclosed in the instant application, the ionized species would inherently has a low solubility in the substrate.

For claim 5, since the ionized species of the prior art is identical to the claimed ionized species, limitation recited in claim 5 is met.

As for claims 20-22, since the implantation causes the implantation region **30** to become amorphous, the crystal lattice of the substrate is inherently disrupted by the implanted species.

3. Claims 7, 9, 23-24 and 26-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gonzalez et al. taken with Yasuda et al. as applied to claims 1, 4, 5, 10-15, 20-22 above, and further in view of Kinugawa of record.

The combination of Gonzalez and Yasuda teaches a method as described above. The combined teaching differs from the claims in not disclosing the crystallography as claimed.

Kinugawa teaches that the performance of a semiconductor device can be improved by fabricating the device on a semiconductor substrate having (110) surface plane as compared to that of fabricated on a conventional semiconductor substrate having (100) surface plane (col. 2, lines 1-27).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the combined teaching by selecting the monocrystalline silicon substrate **10** having (110) surface plane as suggested by Kinugawa because of the advantage mentioned above. Note that when the silicon substrate **10** having (110) surface plane (horizontal crystal plane), the substrate would have equivalent vertical planes (001), (100), (010) (all the equivalent vertical planes are denoted by notation [100]). Furthermore, absent evident to the contrary, when the silicon substrate **10** having (110) surface plane are etched by the wet etch described in Gonzalez, the wet etch would inherently faceting along the [111] crystal plane (e.g., the planes of the diagonal edges 38, 40 in Fig. 5).

As for the structure claims 23-27, the combined process would produces the structure as claimed including the amorphous etch stop region and as well as crystal planes mentioned above.

4. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gonzalez et al. taken with Yasuda et al. and Kinugawa as applied to claims 7, 9, 23-27above, and further in view of Wu of record.

The combined process of Gonzalez, Yasuda and Kinugawa teaches a process as described above. The combined process differs from the claim in not disclosing the pH of the etching basic solution.

Wu teaches an etch selectivity of an inert ions implanted region (see col. 40, lines 21-22) and an unimplanted region using a basic solution of TMAH, KOH, or NaOH. The solution has a pH not less than 9 (col. 39, lines 7-80), which causes the unimplanted region being etched at a faster rate than the implanted region (col. 38, lines 56-59).

It would have been obvious to one of ordinary skill in the art at the.

time the invention was made to modify the combined teaching by making the TMAH, KOH, or NaOH solution having a pH approximately 10 or higher as claimed because such pH, in light of Wu's suggestion, would ensure high etch selectivity between etch stop layer 30 and substrate 10, i.e., the etch stop layer 30 is not etched while the substrate 10 is etched at a fast rate.

Response to Arguments

5. Applicant's arguments with respect to claims 1, 13, 20 and 23 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

6. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Trung Dang whose telephone number is 571-272-1857. The examiner can normally be reached on Mon-Friday 9:30am-6:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith can be reached on 571-272-1907. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for

published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Trung Dang
Primary Examiner
Art Unit 2823

09/18/05